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Environmental mysteries

During the past 30 years, the campaign to reduce air pollution has been one of the great environmental success stories. The Environmental Protection Agency says the air Americans breathe is vastly cleaner than when the government began measuring in the 1970s. And it has the scientific data to back up that claim.

Too bad the EPA can't say the same about the quality of the nation's fresh water, oceans, farmland, forests or urban dumping grounds. In a report issued this week, the independent, non-profit, Heinz Center for Science, Economics and the Environment said that the USA lacks scientific measures to gauge the state of the environment in dozens of critical areas.

For taxpayers and shareholders, the report raises questions about what they're getting for the \$150 billion a year that businesses and all levels of government spend cleaning the environment. Of that huge sum, only \$600 million is spent collecting statistics. Clearly, it is not enough to measure how much past efforts have paid off and what areas need the most attention.

The problem isn't new. Independent environmental analysts have complained about a lack of scientific data since the mid-1980s.

The exception is an elaborate air-quality-monitoring system that has been expanding since the 1970s.

In a shortsighted move, however, Washington has failed to provide funds for comparable measures needed to justify the vast investment in other cleanup efforts. By contrast, the government has agencies dedicated to measuring the economy, population trends, energy usage, health and crime.

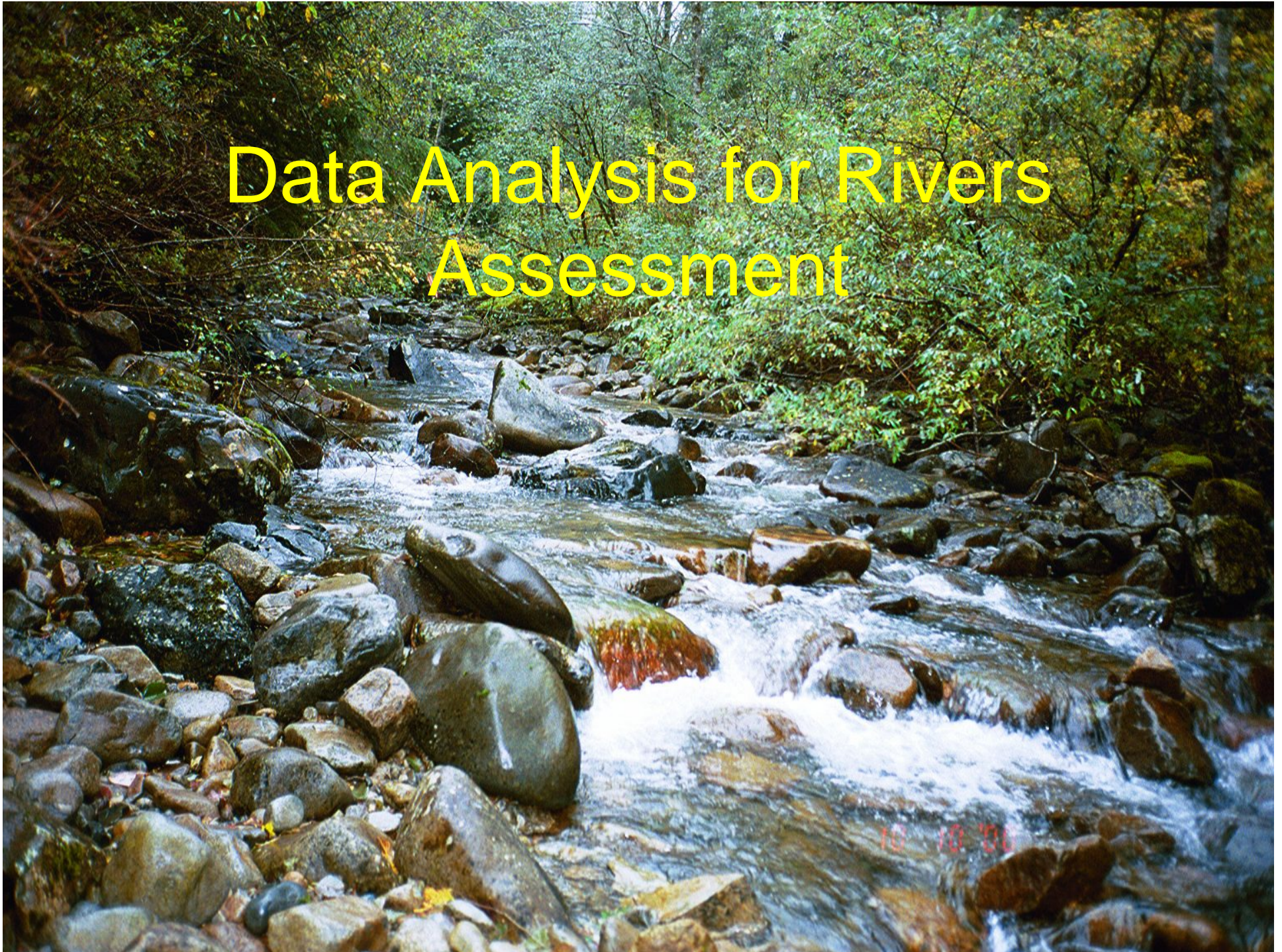
The EPA recognizes its measurement shortcomings. It is completing an ambitious review of the state of the environment, due out later this year, and admits its report will have many blanks.

Among the uncertainties cited by the Heinz report:

- ▶ The types and amounts of contamination in ocean and freshwater fish.
- ▶ The presence of dangerous bacteria levels in waters along U.S. beaches.
- ▶ How frequently forest fires occur today compared with centuries ago.
- ▶ Whether contaminants in urban and suburban soil are increasing or decreasing.

Without such information, the public doesn't know when to celebrate environmental successes, tackle new threats or end efforts that throw money down a drain.

Data Analysis for Rivers Assessment



Bug Index of Biotic Condition

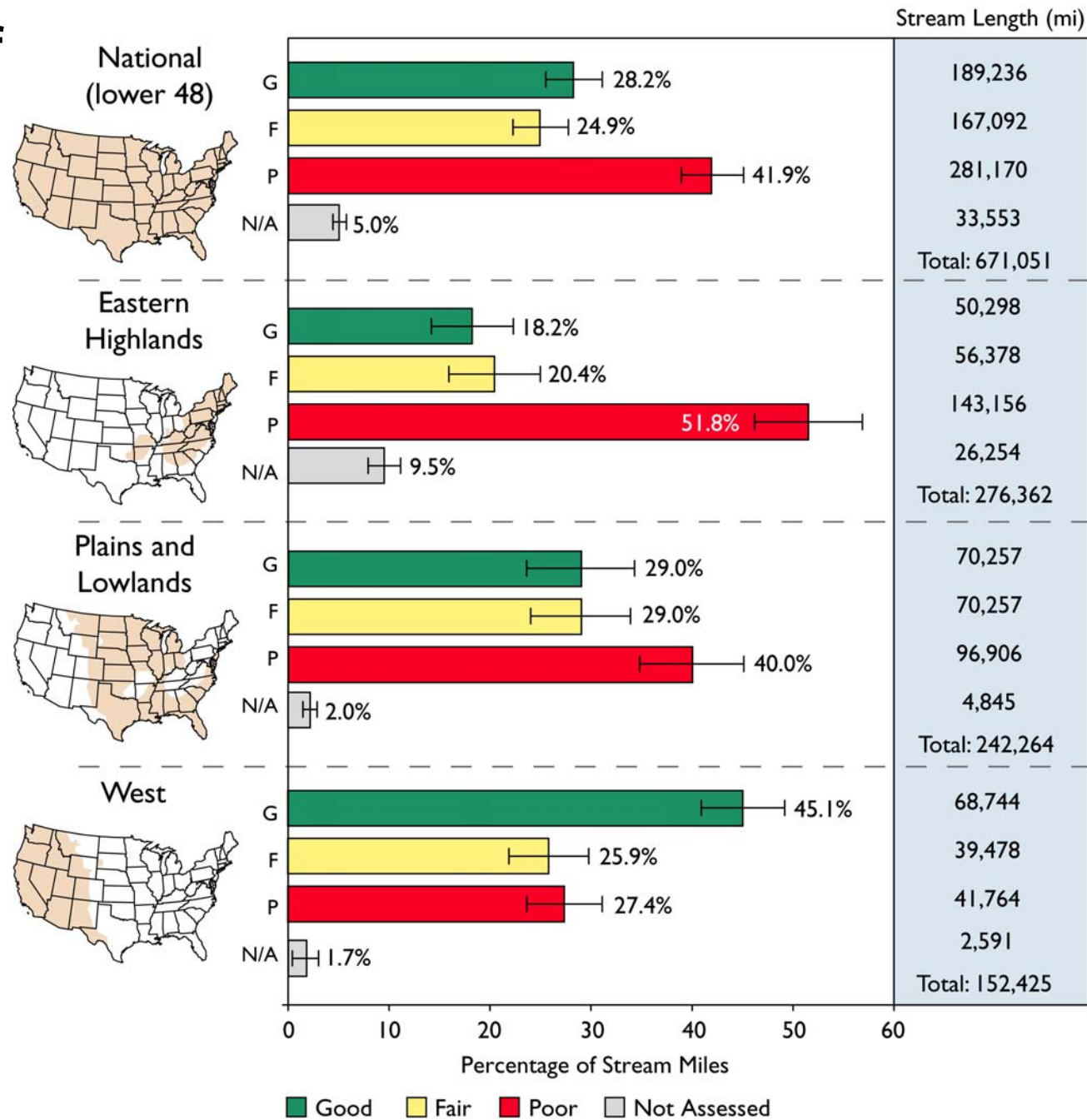


Figure 2-1. Biological condition of streams based on Macroinvertebrate Index of Biotic Condition.

Bug Taxa Loss

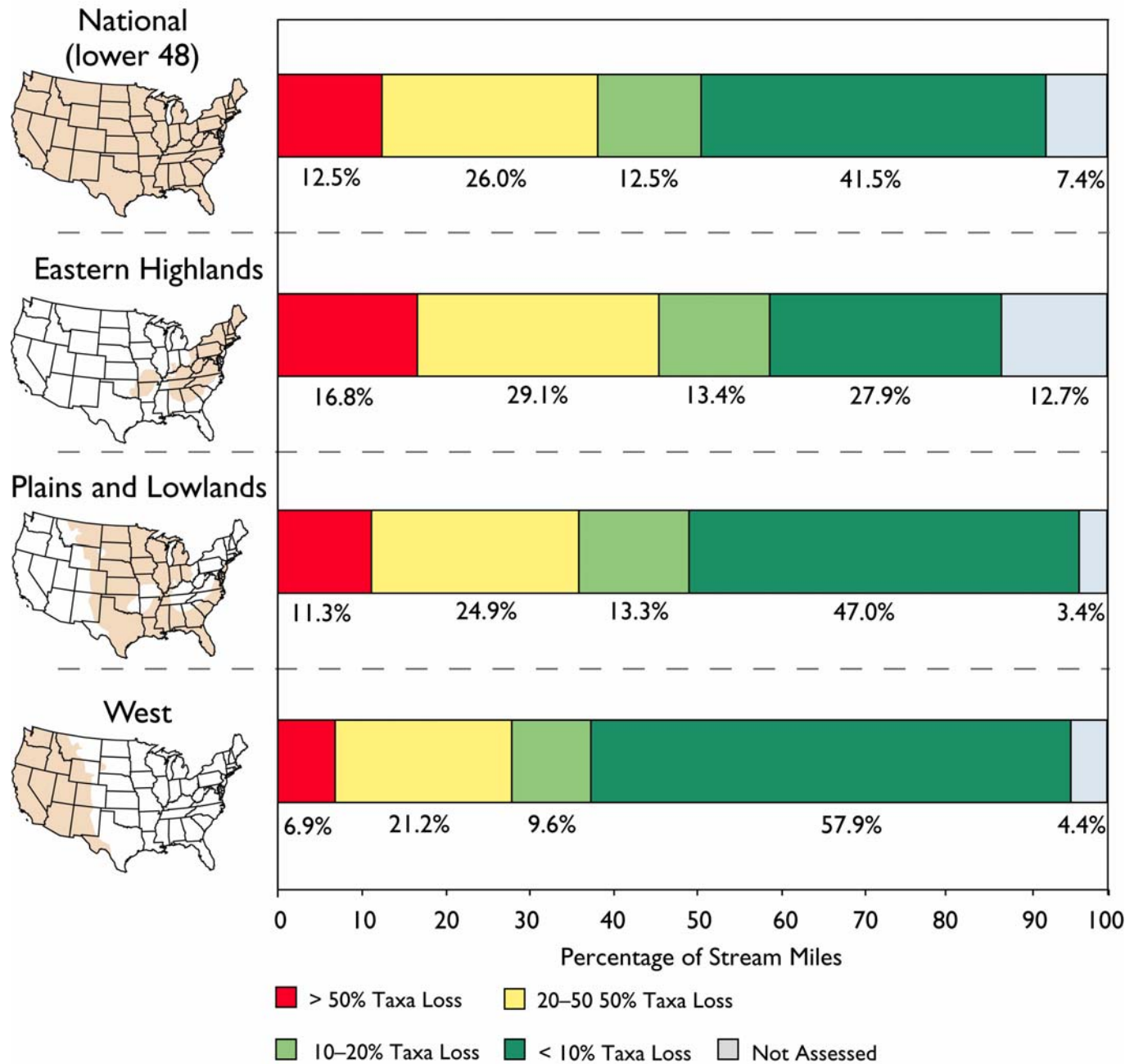
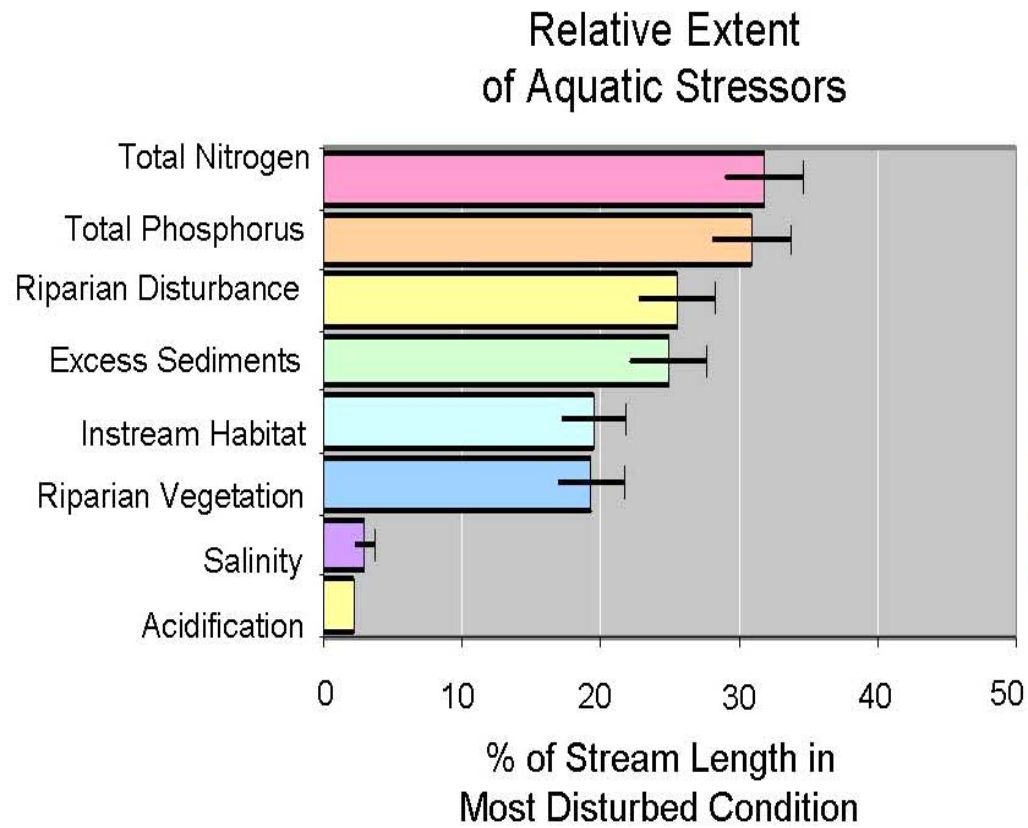


Figure 2-2. Macroinvertebrate taxa loss as measured by the Observed/Expected (O/E) Ratio. The O/E predictive model displays the loss of taxa from a site compared to reference for that region. Scores 0.1 lower than reference represent a 10% loss in taxa.

Ranking of Stressors to Biological Condition



Relative Ranking of Stressors

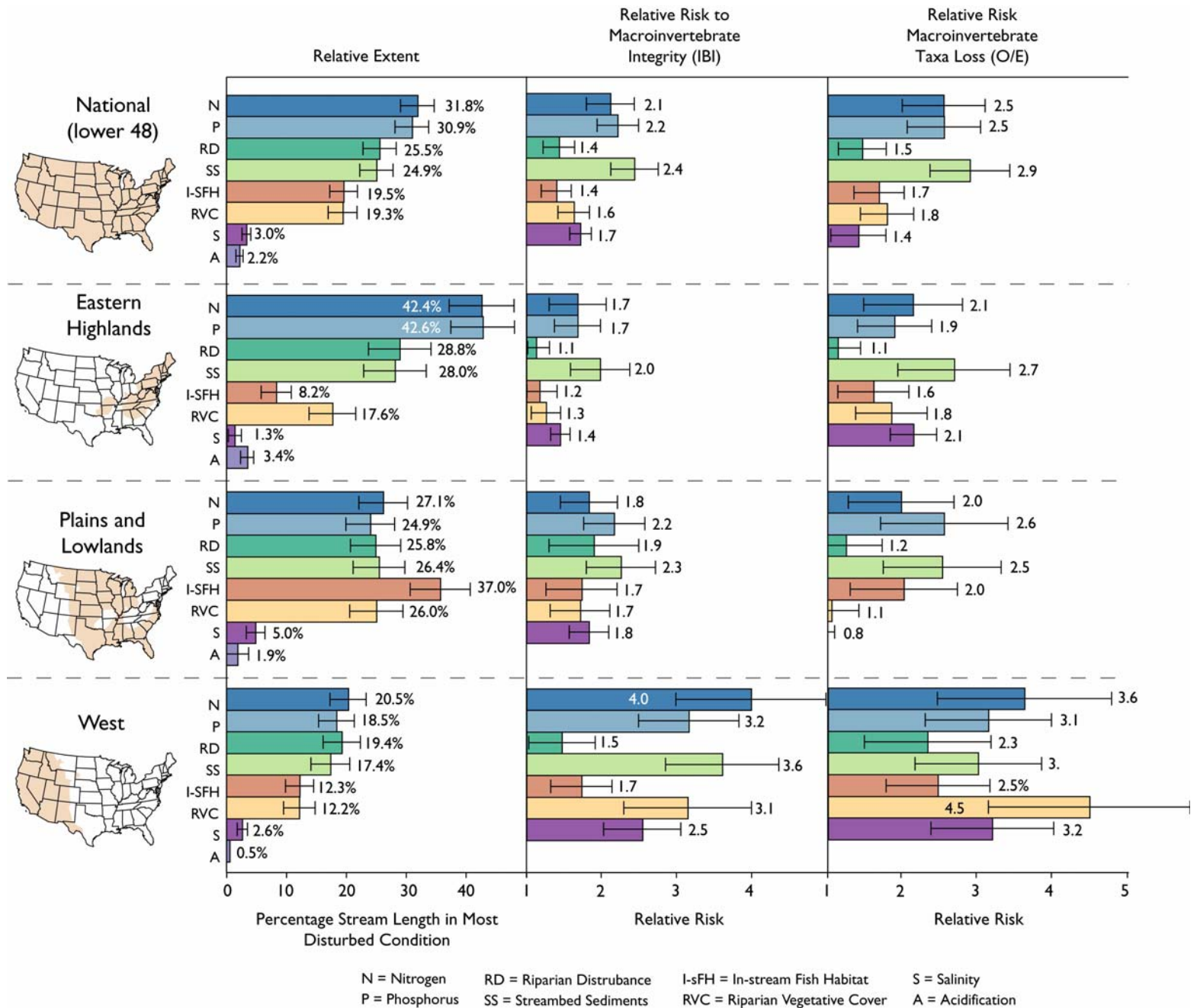


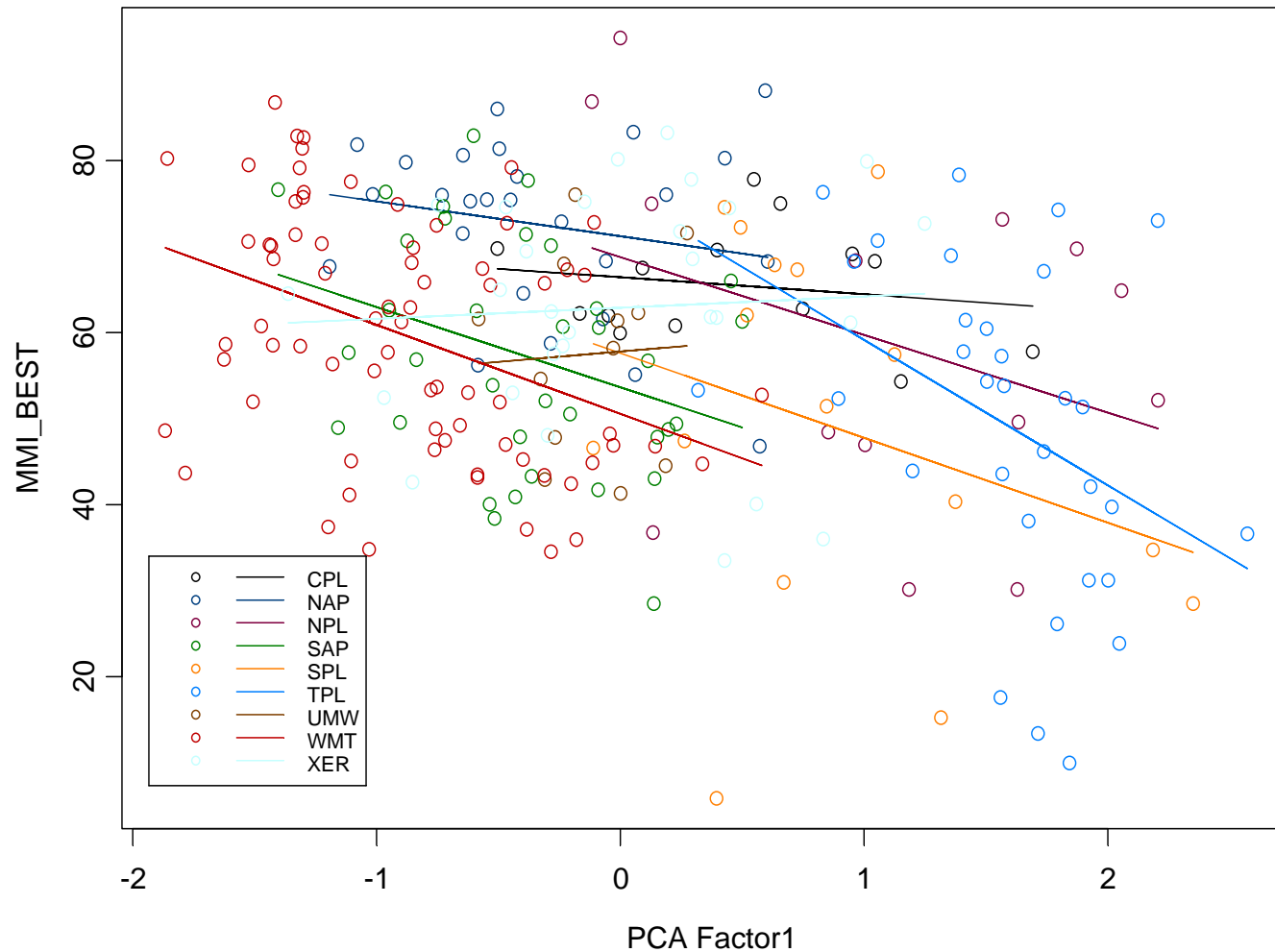
Figure 2-12. Relative extent of stressors and relative risk for Macroinvertebrate Index of Biotic Condition and macroinvertebrate taxa loss.

Steps to Get to Report

- Construct indices for various indicators
 - Biota and “Stressors”
- Develop “thresholds” from reference condition
- Create population estimates for each indicator in each reporting region
- Rank stressors based on extent in “poor” class.
- Develop relative risk estimates for each stressor indicator

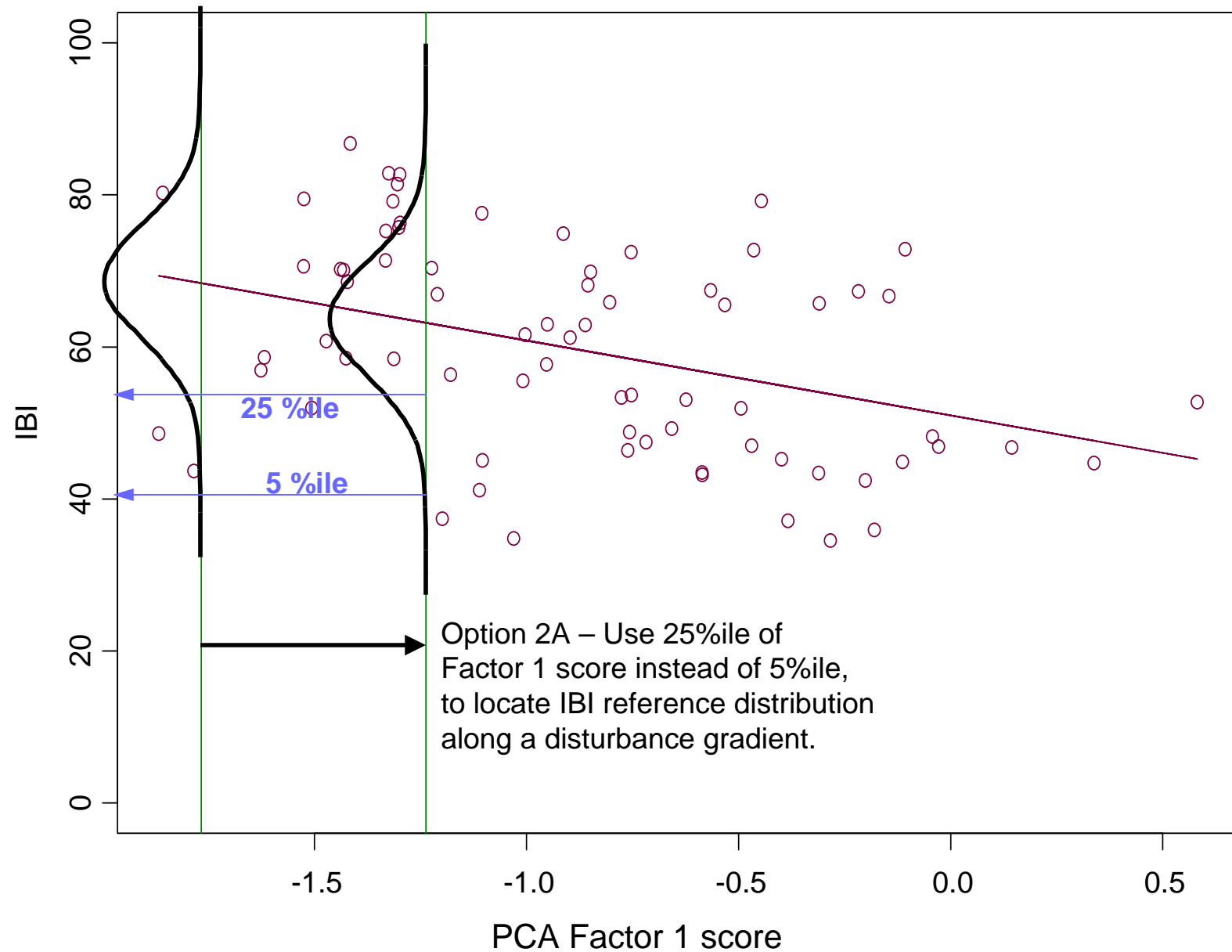
IBI versus PCA Factor 1, by ECO-9 region.

Instead of smooth curves, use simple linear regressions



If a regional regression is significant, then the ‘best’ reference conditions for that region are found near the left end of the region’s regression line.
We used this idea to model the ‘best’ reference distributions for IBI.

‘Option 2a’ – Suggested modification of the PCA-correction method for reference distributions of IBI, as applied to the Western Mountains region.



The Biological Condition Gradient – Tiers

